EMC²

SPC BENCHMARK 1™
EXECUTIVE SUMMARY

EMC CORPORATION
EMC VNX8000

SPC-1 V1.14

Submitted for Review: July 30, 2015
Submission Identifier: A00159

EXECUTIVE SUMMARY

Test Sponsor and Contact Information

Test Sponsor and Contact Information	
Test Sponsor Primary Contact	EMC Corporation – http://www.emc.com Qin Tao – qin.tao@emc.com 228 South Street Hopkinton, MA 02748 Phone: (508) 249-7312 FAX: (508) 249-7463
Test Sponsor Alternate Contact	EMC Corporation – http://www.emc.com John Freeman – john.freeman@emc.com 228 South Street Hopkinton, MA 02748 Phone: (508) 249-5661 FAX: (508) 249-7463
Auditor	Storage Performance Council – http://www.storageperformance.org Walter E. Baker – AuditService@StoragePerformance.org 643 Bair Island Road, Suite 103 Redwood City, CA 94063 Phone: (650) 556-9384 FAX: (650) 556-9385

Revision Information and Key Dates

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SPC-1 Specification revision number	V1.14
SPC-1 Workload Generator revision number	V2.3.0
Date Results were first used publicly	July 30, 2015
Date the FDR was submitted to the SPC	July 30, 2015
Date the Priced Storage Configuration is available for shipment to customers	currently available
Date the TSC completed audit certification	July 27, 2015

Tested Storage Product (TSP) Description

EMC VNX8000 storage system delivers uncompromising scalability and flexibility for the mid-tier while providing market-leading simplicity and efficiency to minimize total cost of ownership.

Based on the powerful family of Intel Xeon E5-2600(Sandy Bridge) processors, the VNX8000 implements a modular architecture that integrates hardware components for block, file and object with concurrent support for native NAS, iSCSI, Fibre Channel, and FCoE protocols. The system leverages the patented ***MCx™ multi-core storage software operating environment*** that delivers unparalleled performance efficiency. Thin Provisioning, deduplication and compression keep these high performing systems operating at maximum effectiveness.

The VNX8000 supports block services, file services, and unified services.

Summary of Results

SPC-1 Reported Data	
Tested Storage Product (TSP) Name: EMC VNX8000	
Metric	**Reported Result**
SPC-1 IOPS™	435,067.33
SPC-1 Price-Performance™	$0.41/SPC-1 IOPS™
Total ASU Capacity	1,100.585 GB
Data Protection Level	Protected 2 *(mirroring)*
Total Price	$176,942.25
Currency Used	U.S. Dollars
Target Country for availability, sales and support	USA

SPC-1 IOPS™ represents the maximum I/O Request Throughput at the 100% load point.

SPC-1 Price-Performance™ is the ratio of **Total Price** to **SPC-1 IOPS™**.

Total ASU (Application Storage Unit) **Capacity** represents the total storage capacity available to be read and written in the course of executing the SPC-1 benchmark.

A **Data Protection Level** of **Protected 2** using ***Mirroring*** configures two or more identical copies of user data..

> ***Protected 2:*** *The single point of failure of any* ***storage device*** *in the configuration will not result in permanent loss of access to or integrity of the SPC-1 Data Repository.*

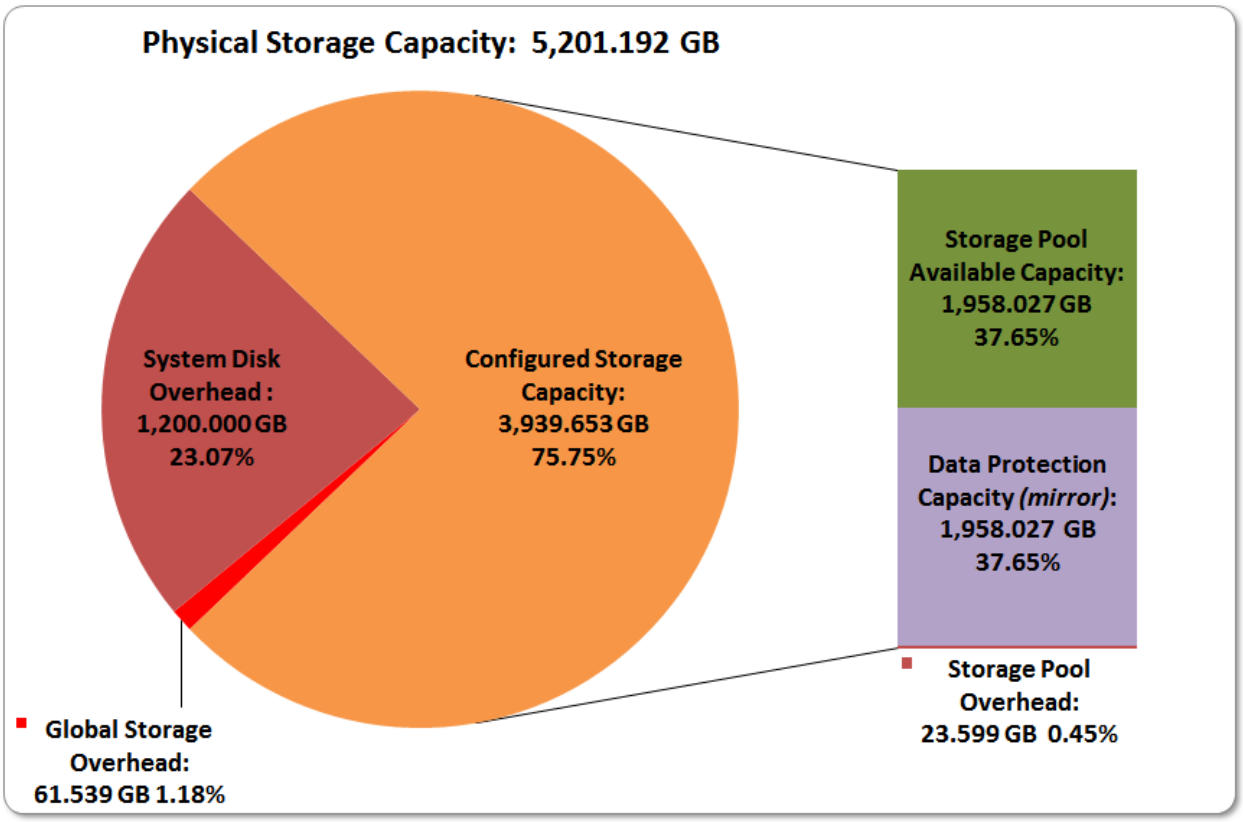
Total Price includes the cost of the Priced Storage Configuration plus three years of hardware maintenance and software support as detailed on page 8.

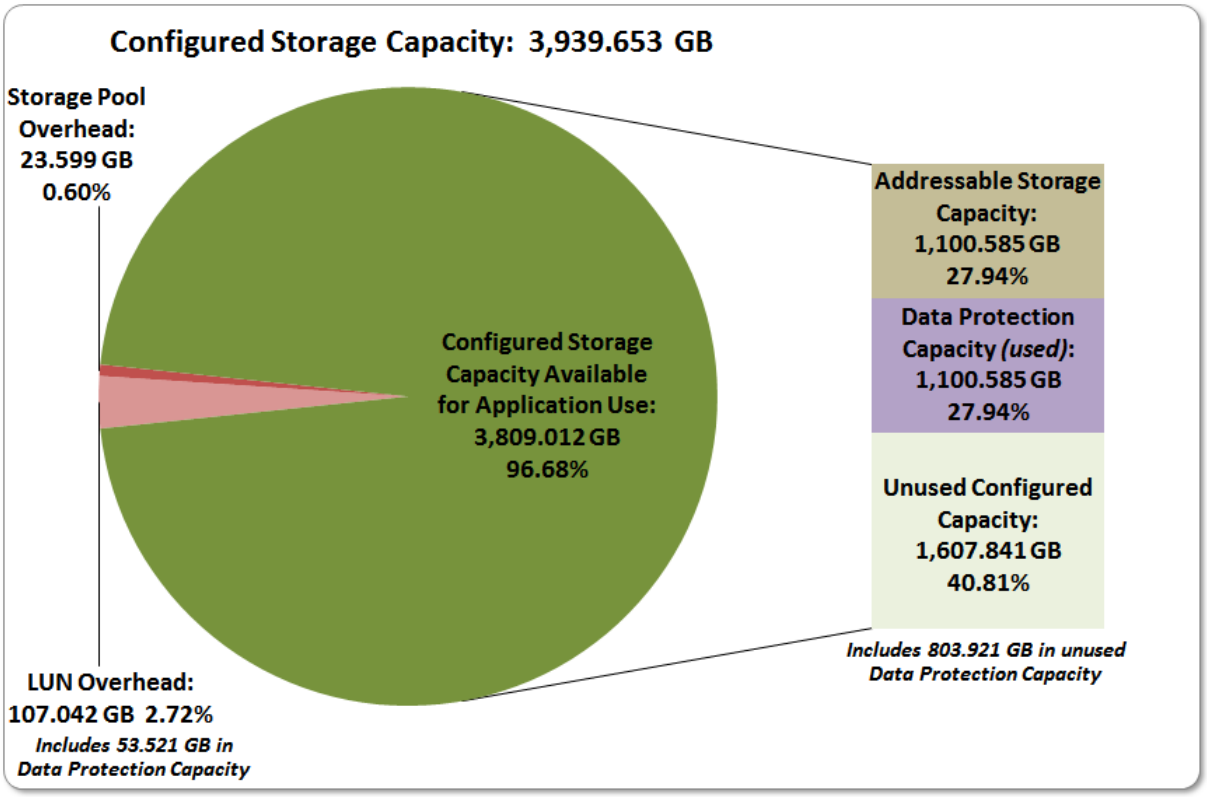
Currency Used is formal name for the currency used in calculating the **Total Price** and **SPC-1 Price-Performance™**. That currency may be the local currency of the **Target Country** or the currency of a difference country *(non-local currency)*.

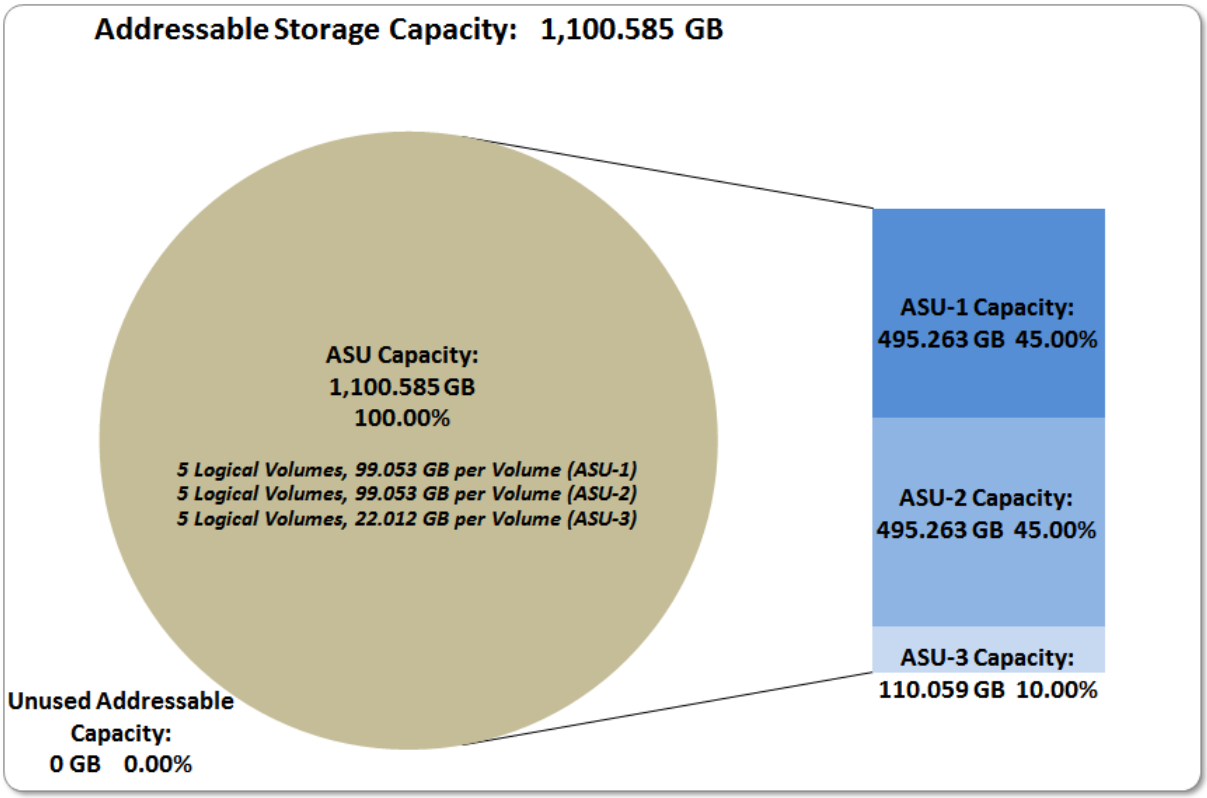
The **Target Country** is the country in which the Priced Storage Configuration is available for sale and in which the required hardware maintenance and software support is provided either directly from the Test Sponsor or indirectly via a third-party supplier.

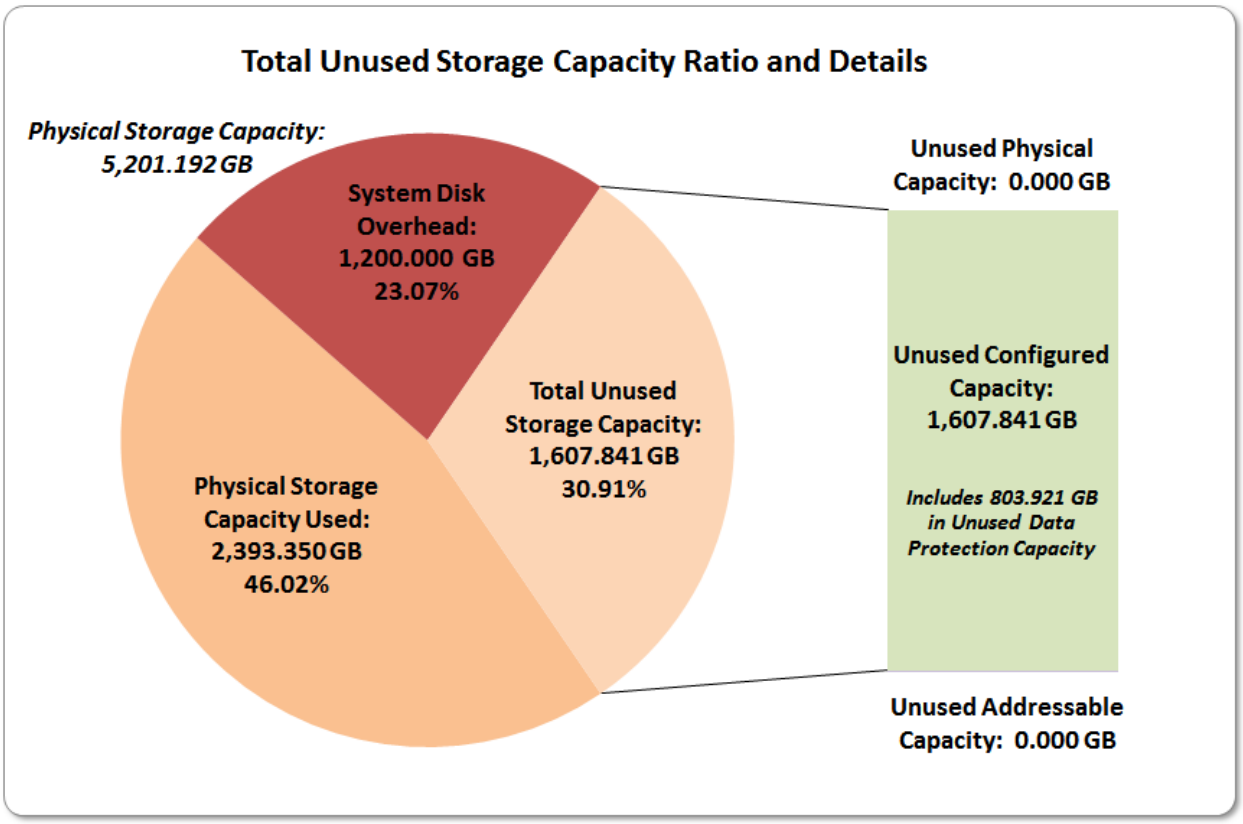
Storage Capacities, Relationships, and Utilization

The following four charts and table document the various storage capacities, used in this benchmark, and their relationships, as well as the storage utilization values required to be reported.




Configured Storage Capacity: 3,939.653 GB
Storage Pool Overhead: 23.599 GB 0.60%
Configured Storage Capacity Available for Application Use: 3,809.012 GB 96.68%
LUN Overhead: 107.042 GB 2.72%
Includes 53.521 GB in Data Protection Capacity
Addressable Storage Capacity: 1,100.585 GB 27.94%
Data Protection Capacity (used): 1,100.585 GB 27.94%
Unused Configured Capacity: 1,607.841 GB 40.81%
Includes 803.921 GB in unused Data Protection Capacity


Addressable Storage Capacity: 1,100.585 GB
ASU Capacity: 1,100.585 GB 100.00%
5 Logical Volumes, 99.053 GB per Volume (ASU-1)
5 Logical Volumes, 99.053 GB per Volume (ASU-2)
5 Logical Volumes, 22.012 GB per Volume (ASU-3)
Unused Addressable Capacity: 0 GB 0.00%
ASU-1 Capacity: 495.263 GB 45.00%
ASU-2 Capacity: 495.263 GB 45.00%
ASU-3 Capacity: 110.059 GB 10.00%



SPC-1 Storage Capacity Utilization	
Application Utilization	21.16%
Protected Application Utilization	43.35%
Unused Storage Ratio	30.91%

Application Utilization: Total ASU Capacity *(1,100.585 GB)* divided by Physical Storage Capacity *(5,201.192 GB)*.

Protected Application Utilization: (Total ASU Capacity *(1,100.585 GB)* plus total Data Protection Capacity *(1,958.027 GB)* minus unused Data Protection Capacity *(803.921 GB)*) divided by Physical Storage Capacity *(5,201.192 GB)*.

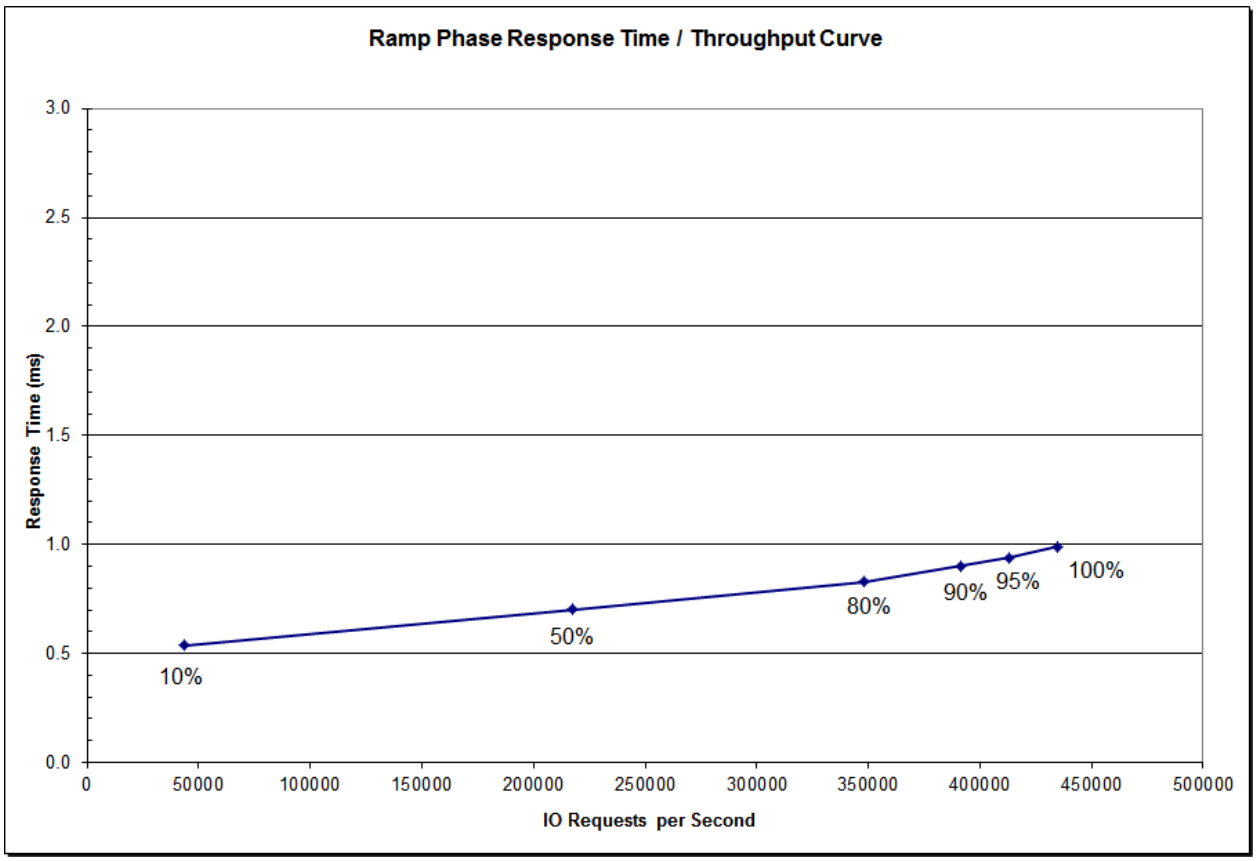
Unused Storage Ratio: Total Unused Capacity *(1,607.841 GB)* divided by Physical Storage Capacity *(5,201.192 GB)* and may not exceed 45%.

Detailed information for the various storage capacities and utilizations is available on pages 25-26 in the Full Disclosure Report.

Response Time – Throughput Curve

The Response Time-Throughput Curve illustrates the Average Response Time (milliseconds) and I/O Request Throughput at 100%, 95%, 90%, 80%, 50%, and 10% of the workload level used to generate the SPC-1 IOPS™ metric.

The Average Response Time measured at the any of the above load points cannot exceed 30 milliseconds or the benchmark measurement is invalid.



Response Time – Throughput Data

	10% Load	50% Load	80% Load	90% Load	95% Load	100% Load
I/O Request Throughput	43,505.81	217,516.82	348,017.00	391,486.38	413,233.32	435,067.33
Average Response Time (ms):						
All ASUs	0.54	0.70	0.83	0.90	0.94	0.99
ASU-1	0.51	0.66	0.78	0.85	0.88	0.93
ASU-2	0.55	0.72	0.87	0.95	0.99	1.05
ASU-3	0.59	0.79	0.92	1.00	1.04	1.09
Reads	0.48	0.58	0.71	0.77	0.81	0.86
Writes	0.57	0.78	0.91	0.98	1.02	1.08

Priced Storage Configuration Pricing

Product	Product Description	Qty	Unit List Price	Product List Price
VNXB80SPE	VNX8000 Storage Processor Enclosure(SPE) with Standard Memory Configuration of 128 GB per SP (256 GB total), 2X4-port 6Gb SAS I/O modules per SP Base Configuration	1	$ 64,277.00	$ 64,277.00
VNXBRACK-40U	VNXB 40U Rack with Front Panel, PDUs	1	$ 2,484.00	$ 2,484.00
VNXB6GSDAE25P	VNXB 25X2.5 Slot 6G SAS PRI Disk Array Enclosure(DAE)	4	$ 4,942.00	$ 19,768.00
V-V4-230015	VNX 300GB 15K 2.5" 4 Vault Disk Set	1	$ 4,970.00	$ 4,970.00
V4-2S6FX-100	VNX 100GB 2.5" FAST VP SSD	40	$ 1,855.00	$ 74,200.00
VNXB-OM3-3M	3M MM FIBRE Cable LC-LC	32	$ 187.00	$ 5,984.00
VSPBM8GFFEA	VNXB 4 Port 8G FC IO Module Pair(SFPs included)	4	$ 3,696.00	$ 14,784.00
VBPW40U-US	CAB QUAD Power Cord US Twistlock	1	$ 680.00	$ 680.00
Total Hardware:				***$ 187,147.00***
VNXBOEPERFTB	VNXB OE PER TB Performance	4	$ 729.00	$ 2,916.00
UNISB-VNX8000	VNX8000 Unisphere Block Suite=IC	1	$ 65,070.00	$ 65,070.00
VNX80-KIT	VNX8000 Documentation Kit=IC	1	$ -	$ -
VNXOE-8000	VNX8000 Operating Environment	1	$ -	$ -
Total Software:				***$ 67,986.00***
PSINST-ESRS	ZERO DOLLAR ESRS INSTALL	1	$ -	$ -
M-PRESWE-001	PREMIUM SW SUPPORT	1	$ 35,138.00	$ 35,138.00
WU-PREHWE-01	PREMIUM HW SUPPORT-WARR UPG	1	$ 16,024.00	$ 16,024.00
Total Warranty & Maintenance:				***$ 51,162.00***
LPE12002-E-G	8Gb HBAs - Emulex LightPulse LPE12002 2-Port	16	$ 530.00	$ 8,480.00
Total Third Party Components				***$ 8,480.00***

Category	List Price Total	Discount	Discounted Price
Hardware	$ 187,147.00	45%	$ 102,930.85
Software	$ 67,986.00	45%	$ 37,392.30
Warranty & Maintenance	$ 51,162.00	45%	$ 28,139.10
Third Party Components	$ 8,480.00		$ 8,480.00
Total:	$ 314,775.00		**$ 176,942.25**

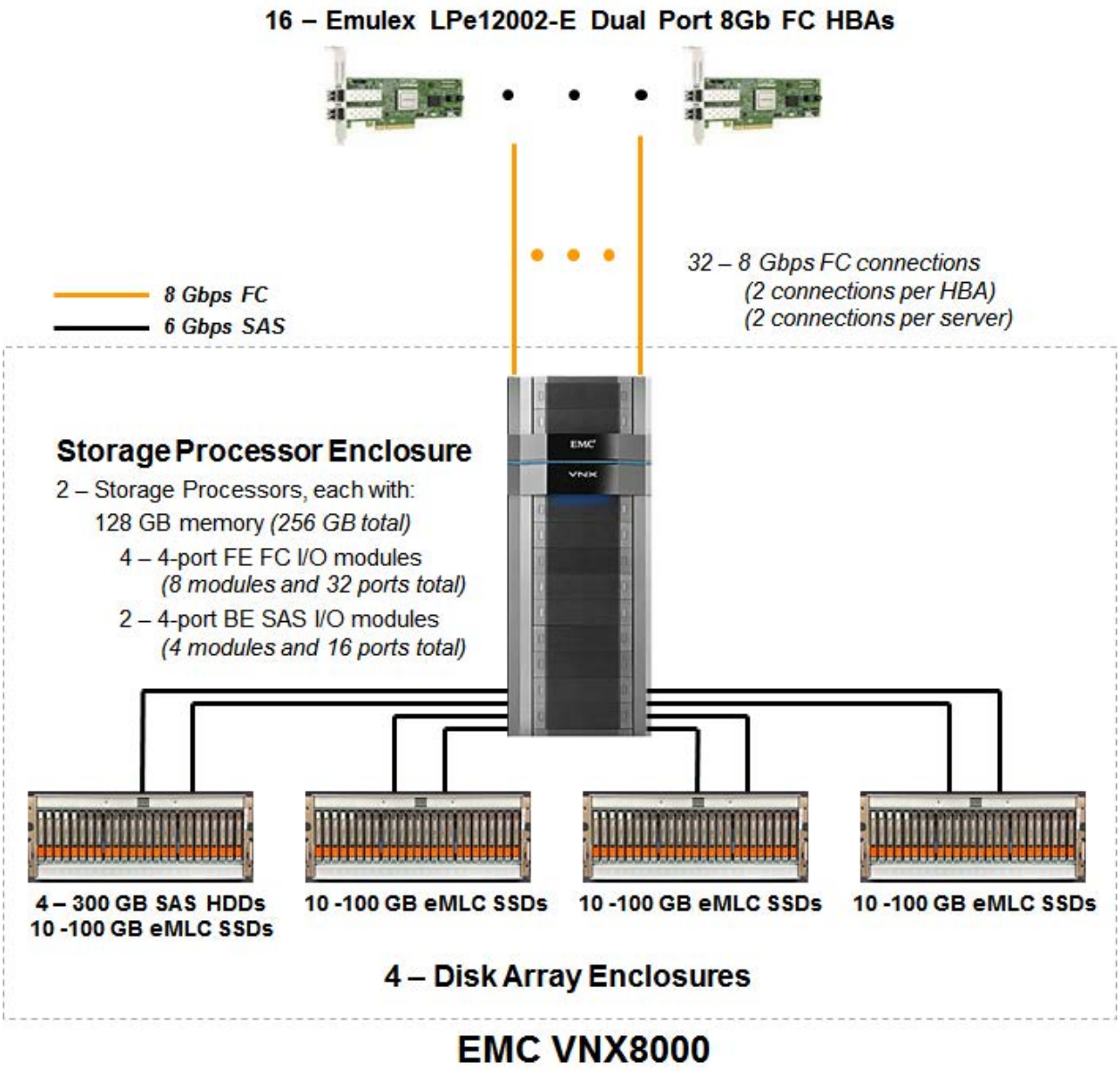
The above pricing includes hardware maintenance and software support for three years, 7 days per week, 24 hours per day. The hardware maintenance and software support provides the following:

- Acknowledgement of new and existing problems within four (4) hours.
- Onsite presence of a qualified maintenance engineer or provision of a customer replaceable part within four (4) hours of the above acknowledgement for any hardware failure that results in an inoperative Priced Storage Configuration that can be remedied by the repair or replacement of a Priced Storage Configuration component.

Differences between the Tested Storage Configuration (TSC) and Priced Storage Configuration

There were no differences between the Tested Storage Configuration and the Priced Storage Configuration.

Priced Storage Configuration Diagram



Priced Storage Configuration Components

Priced Storage Configuration
16 – Emulex LightPulse LPe12002-E Dual Port 8Gb FC HBAs
EMC VNX8000 Dual VNX8000 Storage Processor, each with 128 GB memory *(256 GB total)* 2 – 4 port 6 Gb SAS I/O modules *(4 modules total, 16 ports total and 8 ports used)*
4 – 4 port 8Gb FC I/O Module pairs *(SFPs included)* *(4 modules and 16 ports per Storage Processor, 32 ports total and used)*
4 – 25 x 2.5” slot 6Gb SAS Disk Array Enclosures
4 – 15K RPM 2.5” 300 GB SAS HDDs
40 – 100 GB 2.5” eMLC SSDs
1 – 40U Rack with Front Panel and PDUs